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AUTHOR Baugh, William H.: Stone, Joe A.
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ABSTRACT

Changes in the labor market in the last 20 years are evaluated in order to examine the impact of teacher unionization, the extent of teacher mobility and responsiveness to wage differentials, and the projected demand for teachers from 1980 to 2000. Using cross-section wage regressions and wage change regressions, the study shows that the union-nonunion wage differential has increased rapidly in the 1970s. Regression techniques also reveal that teachers are at least as responsive to wage differentials as other workers, although differentials between teaching and alternative jobs affect educators more than differentials between teaching jobs. The study predicts a modest decline in teacher demand into the mid-to-late 1980s, followed by a modest gain. Over a period of time, demand is found to be fairly insensitive to real wage trends. (Author/WD)

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TRENDS IN THE EDUCATOR LABOR MARKET

by

William H. Baugh and Joe A. Stone

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Trends in the Educator Labor Market

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Introduction

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The labor market for educators has undergone substantial change over the past twenty years. In the 1960s there was significant excess demand, and colleges of education were hard put to supply an adequate number of new teachers. That situtation was dramatically reversed in the early 1970s, when there was an oversupply of teachers relative to available openings. More recently, it appears that in the later 1970s the labor market for teachers was closer to being equilibrated. The period of excess supply saw major increases in unionization of teachers. Even so, in the last decade teacher wages rose only 73 percent, while consumer prices rose 95 percent.

In this paper we examine several aspects of the labor market for educators, including (1) the impact of unionization on the earnings of teachers, (2) the extent to which teachers are responsive to wage differentials when making decisions about leaving the profession or moving to another school district, and (3) projections of the demand for teachers from 1980 to 2000. All three of these aspects are examined at the national level; in addition, wage responsiveness is studied at the state level for Oregon, and demand projections are made for Oregon and Michigan. The final section of the paper provides a brief summary of our findings.

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Impact of Unionization

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Several key theoretical and policy issues may be raised regarding the impact of unionizing public employees of any type. Advocates of the "strong union" position hold that public employee unions have substantial market power. Such unions may play a key role in the political process, threatening to make an "end run" around normal collective bargaining procedures by making wages and other benefits issues in their support for both candidates and elected officials. Politicians are presumed to be more responsive to the highly focused benefit demands of an organized minority than to the broader concerns of the public at large. Moreover, the costs of acceding to public employee demands are diffused over time and over many taxpayers, while the costs to the public of enduring a strike are intensive and immediate. In addition, the demand for public services may be extremely price-inelastic, and the right to offer such services is often a legal monopoly or near-monopoly. Employment elasticities will then be quite low. In this situation Ehrenberg (1973, 378) suggests that "... market forces do not appear to be sufficiently strong to limit the size of real wage increases which state and local government employees may seek in the future." All of these strong union arguments appear to apply to educators. Teacher unions often play key roles in the political process, and governments require household purchases of the educational product through taxation regardless of whether the product is consumed.

Yet an alternative "weak union" set of arguments also appears to apply to public employee unions. Wage demands may be constrained by public opinion; in a time of tax revolts, it is difficult for public employees to demand sufficient real wage increases to match the inflation rate. More importantly, many white-collar public employees have a strong sense of professionalism, and it is often argued that professionalism is orthogonal to unionism. That is, many public employees have a non-union "mindset" in which union membership and activity are seen as inappropriate and incompatible with professionalism. These arguments are particularly true for teachers, who are subject to the pressures of public opinion and have a very strong professional identity.

Virtually all the empirical research conducted in the 1970s lends at least implicit support to these weak union arguments, indicating that teacher unions increase relative wages only marginally. Zero to five percent was the range of increase in state average salaries found by Kasper (1970). Thornton (1971) found a one to four percent increase when he sampled cities with populations over 100,000 in 1969-70. Baird and Landon (1972) found a 4.9 percent increase in minimum salaries in their 1966-67 sample of 44 school districts having 24,000 to 50,000 students. Hall and Carroll (1973) found a 1.8 percent increase in mean salaries for unionized teachers in 118 districts in Cook County, Illinois. Lipsky and Drotning (1973) performed a detailed study of teacher salaries in all 696 districts in New York state for 1967-68. They found collective bargaining not significant in

explaining 1968 salary variations across districts, but significant in explaining changes in district salaries from 1967 to 1968. Higher estimates (five to twelve percent) were obtained by Chambers (1977) in a study of 89 districts in the six largest metropolitan areas in California. Most recently, Perry (1979, 12) concluded in a study of nine diverse school districts that the impact of collective bargaining on "...average teacher salary, overall budget size, and percent of budget devoted to teacher salaries has not been substantial in aggregate terms.",

We have employed two different techniques for measuring the impact unionism has on teacher wages: traditional cross-section wage regressions, and wage change regressions. In the first approach we used a binary union membership variable to measure the impact of unionization; in the second approach we used the premium associated with becoming a union member. Our methodology and empirical results are discussed in detail in our paper "Teachers, Unions, and Wages in the 1970s: Unionism Now Pays," previously submitted. We conclude that unionization of teachers and related teaching personnel increases their wages relative to those for similar nonunion teachers substantially (by twelve to twenty-one percent) and that this union-nonunion wage differential has increased rapidly in the 1970s.

These findings reverse the conclusions of most of the empirical research conducted during the 1970s, but are consistent with auxiliary evidence obtained for the impact of unionization on the wages of nonteaching white-collar public employees. Hence, our findings tend to dispel the weak union arguments

associated with public employee unions in general and teacher unions in particular. It is not clear, however, whether the substantial gains made by teacher unions in recent years result from a self-motivated growth in their own bargaining strength, modifications in labor relations legislation for public employees, changes in public attitudes, a diminution over time of any downward simultaneity bias induced by the association between low wages and unionization efforts, or other factors.

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Mobility and Wage Responsiveness

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The belief that educators are not responsive to wage differentials between teaching and other occupations or to differentials between districts within teaching is widespread. This belief, combined with rigid wage structures within districts, leads to the related perception that wages for teachers are also unresponsive to these wage differentials, hence that existing differentials tend not to be eroded over time. In our paper "Mobility and Wage Equilibration in the Educator Labor Market," separately submitted, we examined four propositions regarding teacher wage responsiveness in detail. First we tested the responsiveness of educators to wage differentials between their teaching jobs and alternative occupations in deciding to leave teaching for other employment. Our empirical results suggest that teachers are at least as responsive to wage differentials as other workers.

Secondly, we tested whether these market wage differentials between teaching and alternative occupations are significant factors in determining individual patterns of wage change from one year to the next, i.e., whether the differentials tend to be eroded over time. Our empirical results suggest that within the span of one year positive market wage differentials for educators , i.e., premiums above the predicted wage, tend to be liquidated more readily than negative differentials. This would tend to occur if the labor market at large were relatively slack, or if the educator labor market were slack relative to the larger market. The period of the 1970s generally exhibits both these characteristics.

Thirdly, we considered the narrower issue of whether educators are responsive to wage differentials within the educator labor market in deciding whether to leave one school district for employment in another. We found that teachers are responsive to wage differentials for teaching jobs, but not as strongly responsive as to wage differentials between teaching and alternative occupations. Moreover, responsibilities for secondary subject areas and extra pay assignments tend to pull some educators and push others across district lines.

Finally, we tested whether the educator wage differentials are a significant factor in determining individual patterns of wage change from one school year to the next, i.e., whether these wage differentials also tend to be eroded over time. Our results indicate that both negative and positive wage differentials tend to be eroded, and that positive differentials are more readily

liquidated than negative differentials when the relevant labor market for educators has excess supply.

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Projections of Demand for Teachers

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To obtain estimates of the demand for teachers for the period 1980-2000, we first derive and estimate an aggregate demand function for teachers. Given estimates of this equation, estimates of the student-age populations, and other assumptions, we project teacher demand over the next twenty years at the national level and for the states of Oregon and Michigan.

Our aggregate demand function for teachers is based upon traditional theory of input demand in the economic theory of production, i.e., the demand for inputs is derived from the demand for the final product. Given some appropriately defined measure of educational output (E), we obtain an input demand function for educators by minimizing total costs of production subject to a minimum output constraint (Eo). Thus, we express the demand for educators (EDUCATORS) as

$$\text{EDUCATORS} = (\underset{+}{Eo} , \underset{-}{\text{WAGE}} , \underset{+}{A}) \qquad (1)$$

where WAGE is the real wage of teachers and A represents the real prices of alternative inputs. (See Ferguson, 1971, for an analysis of the theory of input demand.)

Unfortunately, we have no comprehensive measure of total educational output. Hence, we substitute real per capita income (INCOME) and total enrollments (ENROL) as measures of E, since they are primary determinants (aside from the supply price) of the demand for E. We also ignore the prices of other educational inputs (A). Consequently, we obtain the following implicit demand function for educators:

$$\text{EDUCATORS} = g(\overset{+}{\text{INCOME}}, \overset{+}{\text{ENROL}}, \overset{-}{\text{WAGE}}) \qquad (2)$$

To estimate eq. (2), we assume that the appropriate cost function is Cobb-Douglas, and therefore that eq. (2) can be expressed in log-linear form.

Estimates of the (first-differenced) log-linear specification of eq. (2) based upon annual data from 1947 to 1978 are presented in Table 1. The lag structure was obtained using the following two-stage regression strategy: (1) The equation was estimated with four-year unconstrained lags on all variables; and (2) alternative specifications with reduced numbers of lag coefficients were then estimated. The equation estimated in Table 1 is the one having the highest corrected multiple coefficient of determination among those for which the sum of the lag coefficients for each variable was similar to the sum in the unconstrained four-year lag specification.

The estimated coefficients all have the predicted signs -- the quantity demanded increases with ENROL and INCOME and decreases with WAGE. Enrollment effects appear to persist for at

Table 1 Regression Estimates of an Aggregate Demand Equation for Educators (Annual data, 1947-78)

Independent Variables	Coefficients
Intercept	.013 (2.36)
$\Delta Ln(ENROL)_{t-1}$	.702 (4.28)
$\Delta Ln(ENROL)_{t-4}$	.278 (1.58)
$\Delta Ln(WAGE)_{t-3}$	-.213 (-2.74)
$\Delta Ln(INCOME)_{t-2}$	.218 (3.30)
R^2	.845
No. Observations	26
Durbin-Watson	1.900

Notes: The dependent variable is the ΔLn(EDUCATORS). Coefficients are ordinary least squares estimates. The t-statistics are in parenthesis below each coefficient. ENROL is the total number of students enrolled in K through 12; WAGE is the average salary for teachers in constant dollars; and INCOME is the per capita gross national product in constant dollars. See text for further explanation. Data are from the National Center for Education Statistics and from the Statistical Abstract of the United States.

least four years, and wage and income effects appear to take two to three years. All coefficients but the one for the trailing enrollment variable are significant at the one percent level. Moreover, the sum of the coefficients for the ENROL variables suggests that with AGE and INCOME constant, percentage changes in the demand for educators are linked one-for-one with percentage changes in enrollments. The equation as a whole has substantial predictive power (a multiple coefficient of determination of .845), especially for first-differenced annual data. The hypothesis of serial correlation in the residuals is rejected at the five percent level (the Durbin-Watson statistic is 1.90).

The results of our projections of teacher demand are displayed in Tables 2 (national), 3 (Oregon), and 4 (Michigan). In each case we begin from a base year (1979 for the national data, 1980 for the states) and project demand to the year 2000. Three scenarios are projected in each case, as follows:

Scenario 1: Assume that the percentage change in real wages of teachers equals the percentage change in real income of the population at large.

Scenario 2: Assume that the real wages of teachers fall behind the real income of the population at large by one percent annually.

Table 2 Projections of National Demand for Teachers
(in thousands)

Year	Elementary			Secondary			Total		
	S1	S2	S3*	S1	S2	S3	S1	S2	S3
1975									
1976									
1977									
1978									
1979	1182	1182	1182	1003	1003	1003	2184	2184	2184
1980	1158	1160	1160	986	989	989	2144	2149	2149
1981	1140	1144	1144	963	968	968	2103	2112	2112
1982	1121	1128	1128	937	944	944	2058	2072	2072
1983	1107	1116	1116	907	916	916	2014	2032	2032
1984	1097	1109	1109	884	895	895	1981	2004	2004
1985	1089	1104	1104	874	886	886	1963	1990	1990
1986	1084	1101	1101	871	884	884	1955	1985	1985
1987	1092	1111	1109	861	876	876	1953	1987	1985
1988	1108	1130	1123	847	863	863	1955	1993	1986
1989	1128	1153	1141	828	846	846	1956	1999	1987
1990	1152	1180	1163	806	825	825	1958	2005	1988
1991	1181	1213	1190	791	812	812	1972	2025	2002
1992	1211	1246	1217	784	807	807	1995	2053	2024
1993	1238	1277	1242	784	809	807	2022	2086	2049
1994	1263	1306	1265	791	818	812	2054	2124	2077
1995	1283	1329	1282	810	840	830	2093	2169	2112
1996	1297	1347	1294	836	869	855	2133	2216	2149
1997	1306	1360	1303	863	899	881	2169	2259	2184
1998	1311	1369	1308	891	930	908	2202	2299	2216
1999	1312	1373	1309	916	958	932	2228	2331	2241
2000	1310	1373	1309	936	981	951	2246	2354	2260

Note: See text for definitions of scenarios S1, S2, and S3.

Table 3 Projections of Demand for Teachers in Oregon

Year	Elementary S1	Elementary S2	Elementary S3*	Secondary S1	Secondary S2	Secondary S3	Total S1	Total S2	Total S3
1975									
1976									
1977									
1978									
1979									
1980	16471	16471	16471	10978	10978	10978	27449	27449	27449
1981	16235	16270	16270	11033	11056	11033	27268	27326	27303
1982	16173	16242	16242	10957	11003	10980	27130	27245	27222
1983	16107	16210	16210	10881	10950	10927	26988	27160	27137
1984	16041	16178	16178	10806	10897	10875	26847	27075	27053
1985	16043	16214	16180	10680	10792	10771	26723	27006	26951
1986	16045	16250	16182	10548	10681	10660	26593	26931	26842
1987	16294	16536	16399	10402	10556	10535	26696	27092	26934
1988	16547	16827	16619	10251	10425	10404	26798	27252	27023
1989	16792	17111	16830	10100	10294	10273	26892	27405	27103
1990	17145	17506	17148	9945	10158	10137	27090	27664	27285
1991	17493	17898	17460	9790	10021	10000	27283	27919	27460
1992	17880	18331	17809	9740	8991	9970	27620	28322	27779
1993	18263	18762	18153	9690	9961	9940	27953	28723	28093
1994	18648	19197	18498	9641	9931	9910	28289	29128	28408
1995	19043	19644	18851	9632	9943	9922	28675	29587	28773
1996	19443	20098	19207	9623	9955	9934	29066	30053	29141
1997	19593	20295	19355	9776	10134	10071	29369	30429	29426
1998	19738	20488	19498	9925	10309	10203	29663	30797	29701
1999	19884	20683	19642	10076	10487	10337	29960	31170	29979
2000	19926	20770	19683	10290	10731	10534	30216	31501	30217

Note: See text for definitions of scenarios S1, S2, and S3.

Table 4 Projections of Demand for Teachers in Michigan

Year	Elementary			Secondary			Total		
	S1	S2	S3*	S1	S2	S3	S1	S2	S3
1975									
1976									
1977									
1978									
1979									
1980	45247	45247	45247	41805	41805	41805	87053	87053	87053
1981	44202	44297	44297	41930	42018	41930	86132	86315	86227
1982	43707	43894	43894	41469	41644	41557	85176	85538	85451
1983	43204	43481	43481	41013	41273	41187	84217	84754	84668
1984	42677	43042	43042	40562	40906	40820	83239	83948	83862
1985	42357	42810	42810	39860	40284	40200	82217	83094	83010
1986	42039	42579	42579	39170	39672	39589	81209	82251	82168
1987	42539	43175	42996	38383	38958	38876	80922	82133	81872
1988	43045	43779	43417	37604	38249	38168	80649	82028	81585
1989	43527	44361	43812	36814	37526	37447	80341	81887	81259
1990	44354	45297	44552	35997	36772	36694	80351	82069	81246
1991	45197	46253	45305	35173	36007	35931	80370	82260	81236
1992	46042	47215	46057	34779	35679	35604	80821	82894	81661
1993	46903	48197	46882	34389	35354	35280	81292	83551	82102
1994	47780	49199	47599	33969	34997	34924	81749	84196	82523
1995	48640	50188	48356	33714	34808	34735	82354	84996	83091
1996	49516	51197	49125	33461	34620	34547	82977	85817	83672
1997	49749	51545	49356	33859	35105	34886	83608	86650	84242
1998	49968	51880	49573	34262	35596	35228	84230	87476	84801
1999	50188	52217	49791	34670	36094	35573	84858	88311	85364
2000	50143	52280	49851	35329	36856	36174	85472	89136	86025

Note: See text for definitions of scenarios S1, S2, and S3

Scenario 3: Assume that the real wages of teachers fall by one percent relative to the real income of the population at large in years when the demand for teachers falls, track the national real income in years when demand is constant or rises less than one percent, and rise by one percent in years in which demand for teachers rises by at least one percent.

Scenario 1 is thus the most optimistic from the standpoint of maintining teachers' real income, but in our enrollment-driven model is expected to yield a lower demand for teachers than will Scenario 2. Scenario 3 is expected to yield an intermediate level of demand.

Results of the projections are substantially as expected. The national projections (Table 1) show a decline in total demand for teachers of about nine percent from 1979 to the late-1980s, followed by a slow rise to a year 2000 increase of about three percent over 1979. Because most years show declines or only modest increases in demand, Scenario 3 projections closely track those under Scenario 1. Scenario 2 shows about five percent higher demand by the year 2000 than does Scenario 1. Considering that this represents a net twenty percent decrease in real income

of teachers relative to the general population, it indicates that the demand for teachers is highly inelastic. Our projections under Scenario 1 are quite close overall, and even closer in trend (given the slightly different starting points) to those for the period 1980-1986 under the "low alternative" of the National Center for Education Statistics (Frankel, 1978, 55-57). Their projection was based on an assumption that "ratios of enrollment to the numbers of teachers through 1986 (would) follow the 1966 to 1976 trends." (Frankel, 1978, 49) While our results are similar, we believe our projections are grounded in a stronger theoretical base.

For Oregon, the mid-1980s school-age population decline is proportionally less than for the nation, and there is a correspondingly smaller decline in demand for teachers. There is about a maximum three percent decline in demand, and about a five percent increase over the two-decade span. The demand under the three scenarios is quite similar. The Michigan projections, however, exhibit a greater difference between the three scenarios, due to protracted losses in secondary school-age population resulting from continuing net out-migration. Overall demand is projected to fall under Scenario 1 but rise slightly under Scenarios 2 and 3. The difference between Scenarios 1 and 2 is substantial -- about four percent. Given the significant strength of unionization in Michigan, attempts to sustain teachers' real income may be expected -- and are projected to lead to a nontrivial reduction in the actual numbers of working teachers.

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Conclusions

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We employ a number of techniques to examine different trends in the labor market for educators. Using cross-section wage regressions and wage change regressions we find that unionization of teachers and related teaching personnel increases their wages substantially, and that this union-nonunion wage differential has increased rapidly in the 1970s. These findings reverse the conclusions of most of the empirical research conducted during the 1970s, but are consistent with auxiliary evidence obtained for the impact of unionization on the wages of nonteaching white-collar public employees. Using logit and other regression techniques, we examine the mobility and wage responsiveness of educators. We find that teachers are at least as responsive to wage differentials as other workers; that premiums above the predicted wage in teaching tend to be eroded more rapidly than negative differentials; that wage differentials between teaching jobs tend to affect educators less than differentials between teaching and alternative jobs, and to affect different individuals in different ways; and we find that both positive and negative wage differentials within teaching tend to be eroded over time. Finally, we use an estimated educator demand function to project the demand for educators nationally and for the states of Oregon and Michigan for the period 1980 to 2000. We find a modest decline in demand into the mid-to-late 1980s, followed by a modest gain in demand. That demand is also found

to be fairly insensitive to varying scenarios for real wage trends over time.

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